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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 09/600,931 | 07/21/2000 | KOJI YAMAMOTO | 362-43PCT/U | 2670 |
| 33769 | 7590 | 12/02/2003 | EXAMINER | |
| BODNER & O'ROURKE, LLP 425 BROADHOLLOW ROAD, SUITE 108 MELVILLE, NY 11747 | | | LEE, EUGENE | |
| | | ART UNIT | PAPER NUMBER | |
| | | 2815 | | |

DATE MAILED: 12/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|------------------------|---------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/600,931 | YAMAMOTO ET AL. |
| | Examiner | Art Unit |
| | Eugene Lee | 2815 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 21 October 2003.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-6,8-13 and 15-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) 18 is/are allowed.
- 6) Claim(s) 1-6,8-13 and 15-17 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 13) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
 a) The translation of the foreign language provisional application has been received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s) _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/21/03 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 17 recites the limitation "the further conductive film" in line 11 of said claim. There is insufficient antecedent basis for this limitation in the claim. It is unclear whether "the further conductive film" is referring to the limitation "a conductive film" in line 7 of said claim or whether it is a different conductive film.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1 thru 6, 8 thru 13, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain '423 in view of Shiue et al. '088. Jain discloses (see, for example, FIG. 13) a damascene interconnection comprising a conductor-filled trench (interconnection trench) 64 and insulating pillars (protrusions) 50. FIG. 10 shows a plan view of a pillared landing pad (pad trench) 55 where multiple protrusions are dispersed throughout.

FIG. 6 shows the damascene interconnection formed by a patterned insulating layer 22 over a substrate 20. Conducting segments (conductive film) 32, 44 and 46 lie between insulating pillars 38. In column 5, lines 34-45, Jain states that the incorporation of insulating pillars divides a wider conductor and, hence, minimizes dishing.

Jain does not disclose a contact hole formed within said pad trench to electrically connect said conductive film to a further conductive film formed below said insulating film, wherein said contact hole and said further conductive film substantially suppress an increase in electrical resistance in said pad trench due to formation of said protrusion. However, Shiue shows (see, for example, FIG. 3) a bond pad structure comprising a third metal pad 30, second via plugs (contact hole) 36, and a second metal pad (further conductive film) 32. The third metal pad is connected to the second metal pad through the second via plugs. In the abstract, Shiue teaches that reliable interconnections are provided between the bond pad structure and the next level of integration. Also, in column 1, lines 52-61, Shiue states that such a bonding pad structure provides adequate tensile strength and prevents bond pad peeling and cracking. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to include these second via

plugs and second metal pad in Jain's invention in order to connect the conducting segments of Jain's invention to a further integration within the substrate and provide adequate tensile strength.

Regarding the limitation "substantially suppress an increase in electrical resistance in said pad trench due to formation of said protrusion", it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations.

Regarding claims 4 and 11, see FIG. 3 and element 38. Also, in column 6, lines 45-53, Jain states that many other insulating patterns may be construed that produce the same effect (i.e. reducing dishing by the narrowing of wide trenches).

Allowable Subject Matter

6. Claim 17 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action.

7. Claim 18 is allowed. The following is a statement of reasons for the indication of allowable subject matter: The references of record, either singularly or in combination, do not teach or suggest at least "a semiconductor device comprising a protrusion, a further conductive film; wherein the protrusion is formed as a plurality of insulating protrusions, the further conductive film being formed below the insulating film and the plurality of insulating protrusions; and wherein the semiconductor device further includes a plurality of contact holes formed within the pad trench, each contact hole of the plurality of contact holes being positioned

near at least one insulating protrusion of the plurality of insulating protrusions, at least some of the contact holes being situated between adjacent insulating protrusions."

Response to Arguments

8. Applicant's arguments with respect to claims 1-6, 8-13, and 15-18 have been considered but are moot in view of the new ground(s) of rejection.

Regarding applicant's arguments on page 8, fourth paragraph, that Jain and Shiue et al. patents were provided for different purposes and are, essentially, non-analogous to one another, this argument is not persuasive. It has been held that the determination that a reference is from a non-analogous art is two fold. First, we decide if the reference is within the field of the inventor's endeavor. If it is not, we proceed to determine whether the reference is reasonably pertinent to the particular problem with which the inventor was involved. In re Wood, 202 USPQ 171, 174. In this case, it clear that Jain and Shiue are from the same art, pad interconnect structures in semiconductor devices. In FIG. 10 and 13, Jain clearly discloses a pad 55. Shiue discloses that pads can have multiple levels of circuit integration and such a bonding pad structure provides adequate tensile strength and prevents bond pad peeling and cracking. Therefore, it would have been obvious to one of ordinary skill in the art to make Jain's pad also have multiple levels in order to increase its circuit integration within a substrate and provide adequate tensile strength.

INFORMATION ON HOW TO CONTACT THE USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugene Lee whose telephone number is 703-305-5695. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Eugene Lee
November 24, 2003


GEORGE ECKERT
PRIMARY EXAMINER